Numerical Solution of the infinite-dimensional LQR/LQG-design problem

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The numerical treatment of linear quadratic regulator/gaussian design problems for parabolic partial differential equations requires solving large-scale Riccati equations. In the finite time horizon case, the differential Riccati equation (DRE) arises. We show that within a Galerkin projection framework the solutions of the finite-dimensional DREs converge in the strong operator topology to the solutions of the infinite-dimensional DREs. We also review efficient numerical methods for solving DREs capable of exploiting the structure on the problem (e.g. sparsity, symmetry or low-rank). We discuss several variants of the available methods, which allow to have a fast computation. In particular, the Rosenbrock type methods, BDF methods and different ways for solving the resulting algebraic Riccati equation. The performance of each of these methods is tested in numerical experiments.

References

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